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Barriers and facilitators to the integration of planetary health topics into undergraduate medical education: an exploratory study of medical educator perspectives

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Title:

Barriers and facilitators to the integration of planetary health topics into undergraduate medical education: an exploratory study of medical educator perspectives

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Abstract

Aims:

Planetary health is a trans-disciplinary field that explores the relationship between the escalating climate and environmental crises and human health. In light of the human health cost arising from planetary health issues, there is a need to educate future medical practitioners accordingly. This study investigates the barriers and facilitators to integration of planetary health into undergraduate medical education at an Irish university and makes recommendations for future practice.

Methods:

A qualitative descriptive study design was employed. Twelve semi-structured interviews were conducted with academic staff actively involved in teaching on the undergraduate medical curriculum at RCSI University of Medicine and Health Sciences. Both barriers and facilitators to integrating planetary health into the curriculum were explored. Braun and Clarke’s thematic analysis was utilised to analyse the findings.

Results:

Barriers to integration include: a lack of curricular space, a perceived lack of awareness among students and educators, and, a potential lack of knowledge among educators and senior management in relation to these issues. These barriers were tempered by significant facilitators suggesting a shifting paradigm within institutions, innovative approaches to content delivery, and an increasing demand from undergraduate medical students.

Conclusion:

This study found a demand from medical educators for the integration of planetary health topics into the medical curriculum. It is suggested that significant adaptation of existing medical curricula is required both in Ireland and further afield, to meet this need. Recommendations based on the barriers and facilitators that emerged during the analysis include: emphasising the clinical relevance of these topics, as suggested by the current evidence base; promoting senior and departmental leadership; and, emphasising the potential for improvements in institutional prestige.

Introduction

Climate change and associated environmental degradation are scientific inevitabilities. According to an Intergovernmental Panel on Climate Change Report (2021), many of the ecological disruptions already caused by human activity are irreversible (1). These shifts in climate and environmental stability have already resulted in a myriad of interweaving direct and indirect health effects: severe storms and floods (2), heatwaves and droughts (3), air pollution (4), new and emerging infectious diseases (5-7), biodiversity loss (8), poor mental health (9), reduced food yields (10-12), freshwater depletion (13), and increasing global conflict (14) constituting but a few examples.

The growing global recognition of the impact of climate change and environmental health on human wellbeing necessitates action and the development of novel paradigms (15). Planetary health is a burgeoning field that encourages “evidence-based policies to promote human health and prosperity while preserving the environment which allows us to thrive”. The field relates to the “interdependence of human health, animal health and the health of the environment.” (16).

The term “planetary health” encapsulates the interface between environmental change and human health. For the purposes of this study, the term encompasses sustainable healthcare, climate change, ecological destruction and global warming referenced in the literature.

Planetary health in medical education

The medical physician role as an interface between the public sphere and the realm of science represents an opportunity to promote planetary health awareness within society (17). Planetary health represents an opportunity for the role of the physician to evolve as an eco-literate advocate for global health, beginning with undergraduate medical training (18), (19).

Developing an evidence base

Successful integration and implementation of planetary health topics into an undergraduate medical curriculum requires a strong evidence base. Research literature endorsing the inclusion of planetary health into undergraduate medical curricula based on case studies in medical and nursing education offers a number of suggestions in relation to education and curriculum content (20), (21), (20), (22), (23).

Walpole & Mortimer (2017) (22) evaluated a project seeking to develop and deliver a teaching programme on sustainable healthcare in seven medical schools across the UK. In the analysis, the authors reflect on the importance of educator collaboration in motivating participants and building educator confidence and capacity in unfamiliar educational areas.

Tun (2019) (24) and Tones (2011) (25) investigated the perspectives of medical educators, with both studies highlighting key enablers to integration; including a well-designed curriculum structure, combined with institutional backing and departmental leadership.

This study is the first of its kind in Ireland and builds on previous research exploring the perspectives of medical educators (22), (23), (24), (25). It aims to identify barriers and facilitators to the integration of planetary health topics within undergraduate medical education and make evidence-based recommendations for policy development.

Methods

This study employed qualitative content analysis when exploring the individual perspectives of educators.

This research was carried out at the Royal College of Surgeons in Ireland (RCSI) University of Medicine and Health Sciences; a medical professional and educational institution located in Dublin, Ireland. RCSI has an annual intake of approximately 450 medical students from 60 countries.

Author and reflexivity

The principal researcher is a male and graduated with a degree in medicine (MB BAO BCh) from National University of Ireland, Galway in 2018. At the time of the interviews the principal researcher was in full-time employment as a clinical educator to final-year medical students at the Royal College of Surgeons in Ireland (RCSI).

The author's position as a current employee of RCSI provided a number of advantages when conducting this study. Given that the interviews were conducted over video-call, the participant's relationship with the author may have influenced their responses to the questions posed. However, in order to eliminate bias, participants were explicitly advised as to the fact that the data being recorded would be pseudonymised. Furthermore, the interview endeavoured to remain as neutral as possible when both asking questions and responding to participant statements.

A further advantage conveyed by the author's position as an employee at RCSI is that the author was able to extend invitations to faculty from their RCSI verified e-mail account, possibly lending credibility to the invitation and increasing the likelihood of participant uptake.

Participant selection and data collection

Purposive sampling was employed to identify participants for the semi-structured interviews. All staff involved in the active teaching of undergraduate medical students at RCSI were eligible and invited to participate. Invitation emails were sent to individuals, to achieve a sample that reflected the characteristics of staff across the institution, in terms of gender, role, speciality and position.

Thirty-two email invitations were sent to staff and sixteen staff agreed to participate. Data saturation was achieved after 10 interviews. The definition of data saturation is taken from the description given by (26); no new themes or insights were being gleaned during the course of the interviews. A further two interviews were conducted.

Data analysis

Braun and Clarke's (2006) (27) approach to thematic analysis was employed in the analysis of the semi-structured interviews. This approach was deemed the most suitable analytical method as it encourages a reflexive and organic coding process. Initially each transcribed interview was reviewed, to become familiar with the data, subsequently line-by-line coding was performed. Codes were grouped to identify patterns and points of shared meaning. Through classification of the various codes, a number of categories were identified to which the different codes could be assigned. These categories were assimilated to identify broad initial themes. The identified themes were further reviewed and refined to generate the final themes. The analysis process was reviewed by each author at every subsequent step.

Ethics

Ethical approval for this project was granted by the Royal College of Surgeons in Ireland (RCSI) Research and Ethics Committee (REC)

All educators who participated in the semi-structured interviews were required to sign a consent form prior to the interview. Participants were sent an information leaflet detailing the study prior to the interviews. All interviews were audio-recorded and transcribed. Medical educator responses were pseudonymised. The recordings were transcribed by a professional third party who had no stakes in student education at RCSI (28). Audio recordings were destroyed following their transcription; however transcripts of the interviews will be held for five years on a secure RCSI server.

Students were sent an e-mail invite to participate in the quantitative survey, participants were explicitly informed that their data would be anonymised in the e-mail invite and in an information leaflet sent as an attachment with the invite. Undergraduate medical student responses were anonymised by the SurveyMonkey web app (29).

Patient and public involvement:

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Transparency statement:

The lead author confirms that this manuscript is an honest, accurate, and transparent account of the study being reported; no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

Results

4.1 Participant Demographics

12 interviews were recorded, transcribed and analysed.

Quotes that provided a unique insight or were representative of an overarching opinion held by a number of participants are recorded below.

Each quote stated is followed by a tagline, e.g.; Educator 1, Male, Clinical, Medicine, Junior educator. This is to denote the educator number, gender, whether they hold a clinical or non-

clinical teaching role and their position within the department. The aim is to provide context on stakeholder demographic characteristics.

The distribution across these demographic characteristics is as follows (Table 1):

Table 1 – Medical educator participant demographics

Gender	<u>Male</u>	<u>Female</u>	
	6	6	
Role	<u>Clinical</u>	<u>Non-clinical</u>	
	10	2	
Speciality	<u>Medicine</u>	<u>Surgery</u>	<u>Health Sciences</u>
	6	4	2
Position	<u>Junior</u>	<u>Senior</u>	<u>Department Lead</u>
	6	4	2

The table below represents the barriers and facilitators to the integration of planetary health into undergraduate medical curriculum (Table 2).

Table 2 - Barriers and facilitators

Barriers	Facilitators
<ul style="list-style-type: none">• Perceived lack of relevance among students• Perceived lack of relevance among staff• Lack of knowledge amongst educators• Overcrowded curriculum• Lack of senior management support• Lack of evidence base	<ul style="list-style-type: none">• Demand from students• Demand from physicians and faculty• Senior management support• Embedding/spiralling the content• Enhancement of the university brand• Evidence base

Barriers

1. Perceived lack of relevance among students

The most cited potential barrier to implementing a planetary health curriculum that emerged from the interviews is that students might consider planetary health as lacking relevance within

the medical curriculum. As such, it was suggested that a precise delineation of planetary health topics as they influence human health needs to be demonstrated to undergraduate medical students in order to fully engage their interest and attention.

“There needs to be a knowledge of its impact on what and how it relates to actual presentations to hospital.” (Educator 1, Male, Junior, Clinical, Medicine)

2 Perceived lack of relevance among staff

Half of the educators interviewed suggested that a lack of perceived relevance to planetary health among faculty would constitute a potential barrier. They suggested that educators with a more traditional perspective might perceive these topics as a departure from relevant clinical medicine.

“I think that those who have grown up with the traditional curriculum consider this a very soft science... that's the biggest barrier by a long shot.” (Educator 3, Female, Senior, Clinical, Medicine)

This perspective was apparent at times throughout the interviews. Two educators voiced the opinion that they did not believe planetary health content was relevant to medical education, although this was not a majority held view.

“[Planetary health] it's a waste of my time and a waste of their [students] time because they don't really care.” (Educator 11, Female, Clinical, Surgery)

3 Lack of knowledge amongst educators

Educators considered that they might not have sufficient familiarity with planetary health issues to be equipped to deliver teaching on these topics. Even if it is accepted by policymakers that planetary health merits inclusion in the curriculum, a lack of knowledge amongst educators could prove to be a barrier to its comprehensive teaching.

“We might have staff running the sessions who don't really know what this bit about climate change is and who don't facilitate the session in a way that brings out the things that are important. So, I think it's buy-in, not just for students, but also from staff.” (Educator 12, Female, Senior, Non-clinical, Health sciences)

4 Overcrowded curriculum

Another prominent predicted barrier that emerged during interviews was the perceived lack of space within an already crowded medical curriculum. When introducing new topics or concepts into a curriculum, the perception is that in order to add something new, some existing content needs to be sacrificed.

“Curricula are already massively packed and everyone is just fighting a turf war to ensure that their specialty is represented well.” (Educator 3, Female, Clinical, Medicine)

One means of circumventing this barrier suggested by four participants would be to integrate these topics into already existing curricular content. This is highlighted further in the section “embedding/spiralling the content” below.

5 Lack of senior management support

The importance of senior management support emerged as a significant potential barrier throughout the interviews. In most institutions, senior clinicians and policymakers are seen to set the tone for what is considered salient teaching and hold significant sway in determining the perceived relevance of any new material, both among other educators and the student population.

“The average medical educator, they're not going to keep hammering away at some climate change agenda if they feel that it's not being supported.” (Educator 7, Male, Clinical, Medicine)

6 Lack of evidence base

Planetary health is a relatively new field and given the lack of familiarity that may exist regarding the term within the medical sphere, it might be assumed that it does not have an adequate evidence base to support its theories.

“I think that the strong evidence base might not be there yet either. So, with anything like this, it's slightly newer in its thinking and the ground swell of evidence isn't necessarily there or hasn't been scrutinized.” (Educator 1, Male, Junior, Clinical, Medicine)

The importance of highlighting an existing evidence base also emerged as a potential facilitator when advocating for the integration of this topic into undergraduate medical education, see section below “Evidence base”.

Facilitators

1 Demand from students

Issues of climate and sustainability are seen to be some of the most pressing issues for younger generations. The voice of the collective student body holds gravitas and represents a powerful driver of curriculum reform.

“I think it would be a very powerful message if students and trainees were to bring that message back to the senior management, to the drafters of the programme. I think that's why the university is such a powerful place. I think many, many a good idea was born over a pint of Guinness.” (Educator 9, Male, Departmental lead, Clinical, Surgery)

2 Demand from physicians and faculty

In addition to increasing demand from among the student body, there is also a demand for the inclusion of planetary health topics amongst physicians and faculty.

“I find that educators are generally accepting of this [planetary health] as being an increasingly important thing for doctors to do.” (Educator 5, Male, Department lead, Clinical, Medicine)

The majority of educators interviewed supported this assertion and expressed a belief that planetary health topics were relevant to medical education.

3 Senior management support

Just as a lack of buy-in from university management would represent a significant barrier to the integration of planetary health topics in medical education, conversely, during the course of the interviews, just under half of the educators separately expressed the belief that senior staff

would be willing to bring these topics into the medical curriculum, if presented with a cogent case for inclusion.

“The most senior people at RCSI are very much open to us showing them where we think there is added value for students. If you make the case well to them, they tend to be really supportive.” (Educator 3, Female, Senior, Clinical, Medicine)

4. Embedding and spiralling the content

Given the far-reaching and multi-faceted nature of planetary health issues within medicine, the majority of educators made the argument that these topics should be embedded into a wide range of modules and subjects across the curriculum.

“Because if it's not integrated, we might actually lose the importance of what it is. So, it's quite possible that a lecturer somewhere is teaching this, and we don't know because it's not integrated - it's not spiralled to the curriculum.” (Educator 4, Senior educator, Clinical, Surgical)

Spiralling these topics within the curriculum in this manner provides an opportunity to reinforce previous learning. The essential scaffolding introduced at the outset, ultimately produces a deeper and more comprehensive understanding of the subject material in the graduating student.

“I think ideally, you spiral something so that you have elements of it, or you learn the principles of it in in your first year and then it becomes more applied as you move through the curriculum.” (Educator 10, Female, Junior, Clinical, Medicine)

6 Enhances the university brand

Ultimately, a university with a reputation for a medical curriculum that is dynamic and at the cutting-edge will attract more student interest and greater competition for entry. Incentives such as higher global university rankings and promotion of the Sustainable Development Goals could provide opportunities for enhancement of a university's brand and incentivise a greater environmental focus within an institution.

“How will other universities see RCSI because they have planetary health as part of their curriculum... What does it mean? Will you attract more students? Which universities will compete with you because you have that? Would you get more funding?” (Educator 4, Female, Clinical, Surgical)

7 Evidence base

As discussed previously, inherent to any successful medical curriculum is the necessity to adapt and evolve based on the latest evidence. A quarter of the educators interviewed endorsed the need for utilising the existing evidence base as a facilitator

“I would bombard them with data. I think that there is an education piece for faculty to say - well, look, we know X percentage of disease has an element of climate health involved” (Educator 3, Female, Senior, Clinical, Medicine)

Discussion: Addressing barriers and promoting facilitators

Educator knowledge and awareness

The need to address a perceived lack of knowledge in relation to planetary health topics amongst educators has been highlighted on multiple occasions within the literature (20), (22, 24).

Tun et al. 2020 address this with a follow up article in which they highlighted the need for faculty development within medical education as a crucial goal, with a view to facilitating the integration of planetary health topics into the medical curriculum. The importance of faculty training as an enabler has also been highlighted elsewhere in the literature (22), (30), (31).

Perceived lack of relevance amongst educators

Although a perceived lack of relevance amongst educators was cited as a conceivable barrier by a small number of participants, all but two of the twelve educators acknowledged the necessity of these topics within the medical curriculum. Supporting this finding, although sceptical perspectives are present (32), the majority of educator voices in the literature indicate an acceptance of the relevance of these issues within both nursing and medical education (24) (33, 34), (22, 35-39). For those who do not, raising awareness and educating staff, could help to resolve this issue.

Finding space in the curriculum

The issue of an “overcrowded curriculum” was a barrier articulated by participants in this study and elsewhere in the literature (24), (40), (25). The inclusion of planetary health content should be presented as complementary, with a view to enhancing current curriculum in a way that is progressive and structured, rather than through the annexation of already previously established content (30, 41, 42) A suggested means of achieving this would be through the spiralling of content through the curriculum rather than designating this content to a specific component of a programme. This idea of vertical integration for planetary health topics is one that has been mentioned and endorsed at multiple points throughout the literature (43), (22), (44), (24).

Clinical relevance:

In this study, educators asserted planetary health content should be delivered with a clear emphasis on clinical relevance. This consolidates the findings of Tun et Al. 2019 in their interviews with healthcare educators across the United Kingdom and supports the assertion made by Malau-Aduli et al (2019) (45); that overt clinical relevance is essential in ensuring subject knowledge retention amongst medical students.

Senior management support:

The presence or absence of senior management support was highlighted in the interviews as an important factor in determining the success of planetary health integration. A deficit in senior management support has been identified as a significant barrier in the literature to date (46, 47). In line with this, Tomes (2011) (25) identified organisation structure, stable leadership, and a culture of cooperation as facilitators that would assist in the implementation of planetary health topics and this view is supported by Walpole and Mortimer (2017) (20); recommending “involving clinicians” and “demanding institutional backing” when seeking the inclusion of topics of sustainability into curriculum.

A growing planetary health movement and an expanding evidence base:

Internationally, there are examples of institutions that promote and campaign for the integration of planetary health in healthcare education (12), (48), (49). The Centre for Sustainable Healthcare (2021) (50) in the UK and the Planetary Health Alliance (2022) (51) (based in the USA) are two prominent examples. Universities need to be seen to be responding and adapting to the growing body of evidence that recognises issues of climate change and environmental instability as legitimate public health concerns.

Limitations of the study:

There is some homogeneity in relation to the cohort in that ten of the twelve educators interviewed are clinical educators and the remaining two are involved in the area of health sciences. Future research could explore the perspectives of a broader cohort of educators involved in curriculum delivery in the earlier years of undergraduate medical education in addition to the later, clinical years.

This study was conducted at a single institution in Ireland. Nevertheless, it echoes the findings of similar studies conducted in the United Kingdom (UK) (24), (25). The UK's General medical council's "Outcomes for Graduates" (2018) (52) mandates that all doctors qualifying in the UK understand and can apply the principles of sustainable healthcare (an important concept in planetary health). Although no mutually agreed outcomes for medical graduates yet exist in Ireland, this paper would seek to advocate for the formal inclusion of planetary health competencies as a mandated learning outcome for undergraduate medical graduates in Ireland at an individual University level.

Conclusion

As this study suggests, there is demand from academics and medical educators for the integration of planetary health topics into the medical curriculum. To fulfil this demand, developments need to be made to existing medical curricula in Ireland. To this end, the Climate Health in Medical Education (CHIME) (53) working group in Ireland has recently been established, which would seek to advocate inclusion and aid in the development of planetary health curricular content.

Furthermore, planetary health issues are not confined to medicine alone. Lessons can be taken from planetary health curricular development across all healthcare disciplines. Existing literature pertaining to topics of climate and sustainability within the broader healthcare curricula could inform future research in medical education.

Future research

Considering the barriers and facilitators identified in this study, additional research is necessary in order to develop content and test the delivery of future undergraduate medical curriculum modifications. Future research could focus on the formulation, delivery and piloting of planetary health curriculum content. Examples of this could be research that would support educational development or investigate the efficacy of various pedagogies.

Future recommendations

Based on the findings of this study, formulated below are seven recommendations, which aim to guide the successful integration of planetary health topics into undergraduate medical curriculum both in Ireland and internationally.

1. Demonstrate clinical relevance:

- Clearly demonstrate the importance of planetary health to clinical practice and health outcomes to improve buy-in from both students and faculty.

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- 2. **Demand senior leadership and promote internal leadership:**
 - Seek institutional backing and senior management support for the inclusion of planetary health topics into the medical curriculum.
- 3. **Leverage the university brand:**
 - Highlight the potential of these topics to enhance the university’s reputation. Emphasise existing international mandates for greater inclusion such as the GMC’s “Outcomes for medical graduates 2018” in the UK.
- 4. **Highlight the evidence base:**
 - Emphasise the existing evidence base and the presence of established resources such as the Planetary Health Alliance and the Centre for Sustainable Healthcare.
- 5. **Educate the educators:**
 - Cultivate educator learning in tandem with the students, utilise shared learning resources.
- 6. **Embed into existing curriculum:**
 - Integrate planetary health with existing curriculum content and incorporate it into the diverse array of existing teaching modalities employed in an undergraduate medical curriculum.
- 7. **Spiral the curriculum:**
 - Establish fundamental planetary health concepts in the early years of undergraduate medical training and build upon these concepts in subsequent years.

Contributorship statement

This research was conducted as part of a research masters. The principle author was the postgraduate masters candidate and the other two authors were research supervisors at the Royal College of Surgeons in Ireland. The principle author drafted the research plan and made the proposal for the research.

All authors helped in determining the methodology. At the time of the research the principle author conducted the qualitative interviews on their own. All authors aided in reviewing the results of the research and in writing up the discussion. The principle author drafted the research article itself. All authors edited and helped in writing the final research paper.

Data sharing statement

Data is available on reasonable request. Data from the semi-structured interviews has been pseudonymised i.e individual responses were assigned a code in lieu of participant identifiable data (name/address/date of birth). Data includes the audio recordings of the semi-structured and transcripts of these interviews.

This data is available from the principle author (ORCID ID: [0000-0001-5412-877X](https://orcid.org/0000-0001-5412-877X)).

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Ethics Approval

Ethical approval for this project was granted by the Royal College of Surgeons in Ireland (RCSI) Research and Ethics Committee (REC) (Reference number: **201910013**).

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Competing interest statement

All authors have completed the Unified Competing Interest form (available on request from the corresponding author) and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work

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Title and abstract

Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	1
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	3

Introduction

Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	4
Purpose or research question - Purpose of the study and specific objectives or questions	4

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Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	5
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Context - Setting/site and salient contextual factors; rationale**	5
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	5/6
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	6
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	5/6

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	5/6
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	5/6/7
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	6
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	6
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Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	7
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	11/12

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	11/12
Limitations - Trustworthiness and limitations of findings	12

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	2
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	N/A

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

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Title:

Factors influencing the integration of planetary health topics into undergraduate medical education in Ireland: a qualitative study of medical educator perspectives

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Abstract

Aims:

Planetary health is a trans-disciplinary field that explores the relationship between the escalating climate and environmental crises and human health. In light of the human health cost arising from planetary health issues, there is a need to educate future medical practitioners accordingly. This study investigates the factors influencing the integration of planetary health into undergraduate medical education at an Irish university and makes recommendations for future practice.

Methods:

A qualitative descriptive study design was employed. Twelve semi-structured interviews were conducted with academic staff actively involved in teaching on the undergraduate medical curriculum at RCSI University of Medicine and Health Sciences. Both barriers and facilitators to integrating planetary health into the curriculum were explored. Braun and Clarke’s thematic analysis was utilised to analyse the findings.

Results:

Barriers to integration include: a lack of curricular space, a perceived lack of awareness among students and educators, and, a potential lack of knowledge among educators and senior management in relation to these issues. These barriers were tempered by significant facilitators suggesting a shifting paradigm within institutions, innovative approaches to content delivery, and an increasing demand from undergraduate medical students.

Conclusion:

This study found a demand from medical educators for the integration of planetary health topics into the medical curriculum. It is suggested that significant adaptation of existing medical curricula is required both in Ireland and further afield, to meet this need. Recommendations based on the barriers and facilitators that emerged during the analysis include: emphasising the clinical relevance of these topics, as suggested by the current evidence base; promoting senior and departmental leadership; and, emphasising the potential for improvements in institutional prestige.

Strengths and limitations of this study

- This study was conducted at a single institution in Ireland.
- This study uses semi-structured interviews
- All participants in this study are actively involved in the teaching of undergraduate medical students in Ireland
- There is some homogeneity in relation to the participants, in that ten of the twelve educators interviewed are clinical educators and the remaining two are involved in the area of health sciences

Introduction

Climate change and associated environmental degradation are scientific inevitabilities. According to an Intergovernmental Panel on Climate Change Report (2021), many of the ecological disruptions already caused by human activity are irreversible (1). These shifts in climate and environmental stability have already resulted in a myriad of interweaving direct and indirect health effects: severe storms and floods (2), heatwaves and droughts (3), air pollution (4), new and emerging infectious diseases (5), biodiversity loss (6), poor mental health (7), reduced food yields (8), freshwater depletion (9), and increasing global conflict (10) constituting but a few examples.

What is “planetary health”?

The growing global recognition of the impact of climate change and environmental health on human wellbeing necessitates action and the development of novel paradigms (11). Planetary health is a burgeoning field that encourages “evidence-based policies to promote human health and prosperity while preserving the environment which allows us to thrive”. The field relates to the “interdependence of human health, animal health and the health of the environment.” (12). The term “planetary health” encapsulates the interface between environmental change and human health. For the purposes of this study, the term encompasses sustainable healthcare, climate change, ecological destruction and global warming referenced in the literature.

The medical physician role as an interface between the public sphere and the realm of science presents an opportunity to promote planetary health awareness within society (13). Planetary health represents an opportunity for the role of the physician to evolve as an eco-literate advocate for global health, beginning with undergraduate medical training (14).

Developing an evidence base

Successful integration and implementation of planetary health topics into an undergraduate medical curriculum requires a strong evidence base. Research literature endorsing the inclusion of planetary health into undergraduate medical curricula based on case studies in medical and nursing education offers a number of suggestions in relation to education and curriculum content (15), (16), (17), (18).

Walpole & Mortimer (2017) (17) evaluated a project seeking to develop and deliver a teaching programme on sustainable healthcare in seven medical schools across the UK. In the analysis, the authors reflect on the importance of educator collaboration in motivating participants and building educator confidence and capacity in unfamiliar educational areas.

Tun (2019) (19) and Tomes (2011) (20) investigated the perspectives of medical educators, with both studies highlighting key enablers to integration; including a well-designed curriculum structure, combined with institutional backing and departmental leadership.

Planetary health in Ireland

This study is the first of its kind in Ireland. In contrast to the GMC’s “Outcomes for medical graduates 2018” in the UK, Ireland does not have detailed national graduate outcomes for medical students. In addition, as Nordrum et al. 2022 (21) found there are “examples of planetary health themes throughout the current Irish medical curricula, however, these remain poorly implemented or embedded within the curricula”. This study aims to identify factors influencing the integration of planetary health topics within undergraduate medical education in Ireland and to make evidence-based recommendations for policy development.

Beyond Ireland there are examples of case studies in which planetary health has been incorporated into both medical and nursing curricula (22), (23), (17), (24), (25). However, a

recent study found that only 15% of medical schools globally have incorporated planetary health into their curriculum (26). Although this study is conducted at a single-site, it is likely that the findings of the study will be transferable within a broader context, and will add to the evidence base informing integration of planetary health into undergraduate medical education both nationally and internationally.

Methods

This study employed a qualitative descriptive design and analysis to explore the individual perspectives of educators (27).

The research was carried out at the Royal College of Surgeons in Ireland (RCSI) University of Medicine and Health Sciences; a medical professional and educational institution located in Dublin, Ireland. RCSI has an annual intake of approximately 450 medical students from 60 countries.

Author and reflexivity

The principal researcher is a male and graduated with a degree in medicine (MB BAO BCh) from National University of Ireland, Galway in 2018. At the time of the interviews the principal researcher was in full-time employment as a clinical educator to final-year medical students at the Royal College of Surgeons in Ireland (RCSI).

The author's position as a current employee of RCSI provided a number of advantages when conducting this study. Given that the interviews were conducted over video-call, the participant's relationship with the author may have influenced their responses to the questions posed. However, in order to eliminate bias, participants were explicitly advised as to the fact that the data being recorded would be pseudonymised. Furthermore, the interview endeavoured to remain as neutral as possible when both asking questions and responding to participant statements.

A further advantage conveyed by the author's position as an employee at RCSI is that the author was able to extend invitations to faculty from their RCSI verified e-mail account, possibly lending credibility to the invitation and increasing the likelihood of participant uptake.

Participant selection and data collection

Purposive sampling was employed to identify participants for the semi-structured interviews. All staff involved in the active teaching of undergraduate medical students at RCSI were eligible and invited to participate. Invitation emails were sent to individuals, to achieve a sample that reflected the characteristics of staff across the institution, in terms of gender, role, speciality and position.

Thirty-two email invitations were sent to staff and sixteen staff agreed to participate. Data saturation was achieved after 10 interviews. The definition of data saturation is taken from the description given by Grady 1998 (28); no new themes or insights were being gleaned during the course of the interviews. A further two interviews were conducted.

The interview process

Semi-structured interviews were chosen for this research to allow for the investigation of the views of the participants in an exploratory way, without limiting participant responses.

The semi-structured interview consisted of a series of open-ended questions around pre-determined topics, often with follow-up or probing questions included. The interview guide was developed from a review of the evidence on the topic. The interview was set up to flow around the subject material – rather than conforming prescriptively to an established agenda (29). The interview guide was piloted with two participants.

The topics for discussion during the interview were:

- Participant awareness of planetary health topics
- Perceived relevance of planetary health topics to undergraduate medical education.
- Perceived barriers to the integration of planetary health into undergraduate medical education
- Perceived facilitators to the integration of planetary health into undergraduate medical education

Data analysis

Braun and Clarke's (2006) (30) approach to thematic analysis was employed in the analysis of the semi-structured interviews. This approach was deemed the most suitable analytical method as it encourages a reflexive and organic coding process. Initially each transcribed interview was reviewed, to become familiar with the data, subsequently line-by-line coding was performed. Codes were grouped to identify patterns and points of shared meaning. Through classification of the various codes, a number of categories were identified to which the different codes could be assigned. These categories were assimilated to identify broad initial themes. The identified themes were further reviewed and refined to generate the final themes. The analysis process was reviewed by each author at every subsequent step.

Ethics

Ethical approval for this project was granted by the Royal College of Surgeons in Ireland (RCSI) Research and Ethics Committee (REC)

All educators who participated in the semi-structured interviews were required to sign a consent form prior to the interview. Participants were sent an information leaflet detailing the study prior to the interviews. All interviews were audio-recorded and transcribed. Medical educator responses were pseudonymised. The recordings were transcribed by a professional third party who had no stakes in student education at RCSI (31). Audio recordings were destroyed following their transcription; however transcripts of the interviews will be held for five years on a secure RCSI server.

Students were sent an e-mail invite to participate in the quantitative survey, participants were explicitly informed that their data would be anonymised in the e-mail invite and in an information leaflet sent as an attachment with the invite. Undergraduate medical student responses were anonymised by the SurveyMonkey web app (32).

Patient and public involvement:

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

Transparency statement:

The lead author confirms that this manuscript is an honest, accurate, and transparent account of the study being reported; no important aspects of the study have been omitted; and that any discrepancies from the study as originally planned have been explained.

Results

4.1 Participant Demographics

12 interviews were carried out, recorded, transcribed and analysed.

Quotes that provided a unique insight or were representative of an overarching theme that was identified in a number of interviews are recorded below.

Each quote stated is followed by a tagline, e.g.; Educator 1, Male, Clinical, Medicine, Junior educator. This is to denote the educator number, gender, whether they hold a clinical or non-clinical teaching role and their position within the department. “Clinical” denotes an educator working specifically in medical or surgical education rather than the health sciences. The aim is to provide context on stakeholder demographic characteristics.

The distribution across these demographic characteristics is as follows (Table 1):

Table 1 – Medical educator participant demographics

Gender	<u>Male</u>	<u>Female</u>	
	6	6	
Role	<u>Clinical</u>	<u>Non-clinical</u>	
	10	2	
Speciality	<u>Medicine</u>	<u>Surgery</u>	<u>Health Sciences</u>
	6	4	2
Position	<u>Junior</u>	<u>Senior</u>	<u>Department Lead</u>
	6	4	2

The table below represents the factors influencing the integration of planetary health into undergraduate medical curriculum (Table 2).

Table 2 – Factors influencing the integration of planetary health topics into undergraduate medical education in Ireland

Factors
<ul style="list-style-type: none"> • Perceived relevance among students • Perceived relevance among staff • Educator knowledge • Overcrowded curriculum • Embedding and spiralling the content • Enhancement of the university brand • Lack of senior management support • Evidence base

Factors

1. Perceived relevance among students

The most cited potential barrier to implementing a planetary health curriculum that emerged from the interviews is that students might consider planetary health as lacking relevance within the medical curriculum. As such, it was suggested that a precise delineation of planetary health topics as they influence human health needs to be demonstrated to undergraduate medical students in order to fully engage their interest and attention.

“There needs to be a knowledge of its impact on what and how it relates to actual presentations to hospital.” (Educator 1, Male, Junior, Clinical, Medicine)

However, issues of climate and sustainability are seen to be some of the most pressing issues for younger generations. This educator suggested that students be encouraged to establish their own planetary health initiatives within the institution.

“I think there are student groups that are already building from this, and I am sure they would be very much behind it.. the surgical society, why not the Planetary Health Society?” (Educator 6, Female, Senior Educator, Clinical, Surgical)

The voice of the collective student body holds gravitas and represents a powerful driver of curriculum reform.

“I think it would be a very powerful message if students and trainees were to bring that message back to the senior management, to the drafters of the programme. I think that's why the university is such a powerful place. I think many, many a good idea was born over a pint of Guinness.” (Educator 9, Male, Departmental lead, Clinical, Surgery)

2 Perceived relevance among staff

Half of the educators interviewed suggested that a lack of perceived relevance to planetary health among faculty would constitute a potential barrier. They suggested that educators with a more traditional perspective might perceive these topics as a departure from relevant clinical medicine.

“I think that those who have grown up with the traditional curriculum consider this a very soft science... that's the biggest barrier by a long shot.” (Educator 3, Female, Senior, Clinical, Medicine)

This perspective was apparent at times throughout the interviews. Two educators voiced the opinion that they did not believe planetary health content was relevant to medical education, although this was not a majority held view.

“[Planetary health] it's a waste of my time and a waste of their [students] time because they don't really care.” (Educator 11, Female, Clinical, Surgery)

However, in addition to increasing demand from among the student body, there is also a demand for the inclusion of planetary health topics amongst physicians and faculty.

“I find that educators are generally accepting of this [planetary health] as being an increasingly important thing for doctors to do.” (Educator 5, Male, Department lead, Clinical, Medicine)

The majority of educators interviewed supported this assertion and expressed a belief that planetary health topics were relevant to medical education.

3 Educator knowledge

Educators considered that they might not have sufficient familiarity with planetary health issues to be equipped to deliver teaching on these topics. Even if it is accepted by policymakers that planetary health merits inclusion in the curriculum, a lack of knowledge amongst educators could prove to be a barrier to its comprehensive teaching.

“We might have staff running the sessions who don't really know what this bit about climate change is and who don't facilitate the session in a way that brings out the things that are important. So, I think it's buy-in, not just for students, but also from staff.” (Educator 12, Female, Senior, Non-clinical, Health sciences)

4 Overcrowded curriculum

Another prominent predicted barrier that emerged during interviews was the perceived lack of space within an already crowded medical curriculum. When introducing new topics or concepts into a curriculum, the perception is that in order to add something new, some existing content needs to be sacrificed.

“Curricula are already massively packed and everyone is just fighting a turf war to ensure that their specialty is represented well.” (Educator 3, Female, Clinical, Medicine)

One means of circumventing this barrier suggested by four participants would be to integrate these topics into already existing curricular content. This is highlighted further in the section “embedding/spiralling the content” below.

4. Embedding and spiralling the content

Given the far-reaching and multi-faceted nature of planetary health issues within medicine, the majority of educators made the argument that these topics should be embedded into a wide range of modules and subjects across the curriculum.

“Because if it's not integrated, we might actually lose the importance of what it is. So, it's quite possible that a lecturer somewhere is teaching this, and we don't know because it's not integrated - it's not spiralled to the curriculum.” (Educator 4, Senior educator, Clinical, Surgical)

Spiralling these topics within the curriculum in this manner provides an opportunity to reinforce previous learning. The essential scaffolding introduced at the outset, ultimately produces a deeper and more comprehensive understanding of the subject material in the graduating student.

“I think ideally, you spiral something so that you have elements of it, or you learn the principles of it in in your first year and then it becomes more applied as you move through the curriculum.” (Educator 10, Female, Junior, Clinical, Medicine)

Specifically, in terms of teaching pedagogies. Educators endorsed both case-based learning and small group/peer-learning as teaching methods for planetary health topics.

“By integrating this into, for example, case-based learning we're able to draw some of these themes into actual real-life cases.. that's a much more effective way of learning than just sitting listening to lectures or reading a textbook.” (Educator 5, Male, Department lead, Clinical, Medicine)

“To help facilitate [teaching], you could direct small group peer-learning in order to try to get the big topics cemented into the consciousness of the students.” (Educator 1, Male, Junior, Clinical, Medicine)

More traditional teaching methods such as didactic teaching or dedicating an overt module to the subject of planetary health were ideas also endorsed by some educators. to establish the content in the earlier years of medical education, and if there was an element of student-delivery as part of these sessions – to promote student engagement:

“I do think there should be some element of a mix of didactic sessions where topics are broached and I do think it'd be really important that the students themselves be involved in presenting ideas.” (Educator 6, Female, Senior Educator, Clinical, Surgical)

5 Senior management support

The importance of senior management support emerged as a significant potential barrier throughout the interviews. In most institutions, senior clinicians and policymakers are seen to set the tone for what is considered salient teaching and hold significant sway in determining the perceived relevance of any new material, both among other educators and the student population.

“The average medical educator, they're not going to keep hammering away at some climate change agenda if they feel that it's not being supported.” (Educator 7, Male, Clinical, Medicine)

Just as a lack of buy-in from university management would represent a significant barrier to the integration of planetary health topics in medical education, conversely, during the course of the

interviews, just under half of the educators separately expressed the belief that senior staff would be willing to bring these topics into the medical curriculum, if presented with a cogent case for inclusion.

“The most senior people at RCSI are very much open to us showing them where we think there is added value for students. If you make the case well to them, they tend to be really supportive.” (Educator 3, Female, Senior, Clinical, Medicine)

6 Lack of evidence base

Planetary health is a relatively new field and given the lack of familiarity that may exist regarding the term within the medical sphere, it might be assumed that it does not have an adequate evidence base to support its theories.

“I think that the strong evidence base might not be there yet either. So, with anything like this, it's slightly newer in its thinking and the ground swell of evidence isn't necessarily there or hasn't been scrutinized.” (Educator 1, Male, Junior, Clinical, Medicine)

Inherent to any successful medical curriculum is the necessity to adapt and evolve based on the latest evidence. A quarter of the educators interviewed endorsed the need for utilising the existing evidence base as a facilitator

“I would bombard them with data. I think that there is an education piece for faculty to say - well, look, we know X percentage of disease has an element of climate health involved” (Educator 3, Female, Senior, Clinical, Medicine)

7 Enhances the university brand

Ultimately, a university with a reputation for a medical curriculum that is dynamic and at the cutting-edge will attract more student interest and greater competition for entry. Incentives such as higher global university rankings and promotion of the Sustainable Development Goals could provide opportunities for enhancement of a university’s brand and incentivise a greater environmental focus within an institution.

“How will other universities see RCSI because they have planetary health as part of their curriculum... What does it mean? Will you attract more students? Which universities will compete with you because you have that? Would you get more funding?” (Educator 4, Female, Clinical, Surgical)

Discussion: Addressing barriers and promoting facilitators

Educator knowledge and awareness

The need to address a perceived lack of knowledge in relation to planetary health topics amongst educators has been highlighted on multiple occasions within the literature (15), (17, 19).

Tun et al. 2020 address this with a follow up article in which they highlighted the need for faculty development within medical education as a crucial goal, with a view to facilitating the integration of planetary health topics into the medical curriculum. The importance of faculty training as an enabler has also been highlighted elsewhere in the literature (17), (33).

Perceived lack of relevance amongst educators

Although a perceived lack of relevance amongst educators was cited as a conceivable barrier by a small number of participants, all but two of the twelve educators acknowledged the necessity of these topics within the medical curriculum. Supporting this finding - although sceptical perspectives are present (34) - the majority of educator voices in the literature indicate an acceptance of the relevance of these issues within both nursing and medical education (17, 19), (35-37). For those who do not, raising awareness and educating staff, could help to resolve this issue.

Finding space in the curriculum

The issue of an “overcrowded curriculum” was a barrier articulated by participants in this study and elsewhere in the literature (19), (38), (20). The inclusion of planetary health content should be presented as complementary, with a view to enhancing current curriculum in a way that is progressive and structured, rather than through the annexation of already previously established content (33, 39, 40). A suggested means of achieving this would be through the spiralling of content through the curriculum rather than designating this content to a specific component of a programme. This idea of vertical integration for planetary health topics is one that has been mentioned and endorsed at multiple points throughout the literature (41), (17), (42), (19).

Clinical relevance:

In this study, educators asserted planetary health content should be delivered with a clear emphasis on clinical relevance. This consolidates the findings of Tun et Al. 2019 in their interviews with healthcare educators across the United Kingdom and supports the assertion made by Malau-Aduli et al (2019) (43); that overt clinical relevance is essential in ensuring subject knowledge retention amongst medical students.

Senior management support:

The presence or absence of senior management support was highlighted in the interviews as an important factor in determining the success of planetary health integration. A deficit in senior management support has been identified as a significant barrier in the literature to date (44, 45). In line with this, Tomes (2011) (20) identified organisation structure, stable leadership, and a culture of cooperation as facilitators that would assist in the implementation of planetary health topics and this view is supported by Walpole and Mortimer (2017) (15); recommending “involving clinicians” and “demanding institutional backing” when seeking the inclusion of topics of sustainability into curriculum.

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A growing planetary health movement and an expanding evidence base:

Internationally, there are examples of institutions that promote and campaign for the integration of planetary health in healthcare education (46), (47), (48). The Centre for Sustainable Healthcare (2021) (49) in the UK and the Planetary Health Alliance (2022) (50) (based in the USA) are two prominent examples. Universities need to be seen to be responding and adapting to the growing body of evidence that recognises issues of climate change and environmental instability as legitimate public health concerns.

The UK’s General medical council’s “Outcomes for Graduates” (2018) (51) mandates that all doctors qualifying in the UK understand and can apply the principles of sustainable healthcare (an important concept in planetary health). Although no mutually agreed outcomes for medical graduates yet exist in Ireland, this paper would seek to advocate for the formal inclusion of planetary health competencies as a mandated learning outcome for undergraduate medical graduates in Ireland at an individual University level.

Limitations of the study:

There is some homogeneity in relation to the cohort in that ten of the twelve educators interviewed are clinical educators and the remaining two are involved in the area of health sciences. The low number of non-clinical staff in this study is a limitation. Future research could explore the perspectives of a broader cohort of educators involved in curriculum delivery in the earlier years of undergraduate medical education in addition to the later, clinical years.

This study was conducted at a single institution in Ireland. The absence of a comparison between institutions at other sites is a potential limitation for this study.

Conclusion

As this study suggests, there is demand from academics and medical educators for the integration of planetary health topics into the medical curriculum. To fulfil this demand, developments need to be made to existing medical curricula in Ireland. To this end, the Climate Health in Medical Education (CHIME) (52) working group in Ireland has recently been established, which would seek to advocate inclusion and aid in the development of planetary health curricular content.

Furthermore, planetary health issues are not confined to medicine alone. Lessons can be taken from planetary health curricular development across all healthcare disciplines. Existing literature pertaining to topics of climate and sustainability within the broader healthcare curricula could inform future research in medical education.

Future research

Considering the barriers and facilitators identified in this study, additional research is necessary in order to develop content and test the delivery of future undergraduate medical curriculum modifications. Future research could focus on the formulation, delivery and piloting of planetary health curriculum content. Examples of this could be research that would support educational development or investigate the efficacy of various pedagogies.

Recommendations

Based on the findings of this study, formulated below are seven recommendations, which aim to guide the successful integration of planetary health topics into undergraduate medical curriculum both in Ireland and internationally.

1. Demonstrate clinical relevance:

- Clearly demonstrate the importance of planetary health to clinical practice and health outcomes to improve buy-in from both students and faculty.

2. Demand senior leadership and promote internal leadership:

- Seek institutional backing and senior management support for the inclusion of planetary health topics into the medical curriculum.

3. Leverage the university brand:

- Highlight the potential of these topics to enhance the university's reputation. Emphasise existing international mandates for greater inclusion such as the GMC's "Outcomes for medical graduates 2018" in the UK.

4. Highlight the evidence base:

- Emphasise the existing evidence base and the presence of established resources such as the Planetary Health Alliance and the Centre for Sustainable Healthcare.

5. Educate the educators:

- Cultivate educator learning in tandem with the students, utilise shared learning resources. Specifically educate around the health effects related to climate and environmental disruption.

6. Embed into existing curriculum:

- Integrate planetary health with existing curriculum content and incorporate it into the diverse array of existing teaching modalities employed in an undergraduate medical curriculum. A blended approach is recommended, including of case-based teaching, small group and peer learning, and didactic methods.

7. Spiral the curriculum:

- Establish fundamental planetary health concepts in the early years of undergraduate medical training and build upon these concepts in subsequent years.

Contributorship statement

This research was conducted as part of a research masters. The principle author was the postgraduate masters candidate and the other two authors were research supervisors at the Royal College of Surgeons in Ireland. The principle author drafted the research plan and made the proposal for the research. OBB, AW and DS helped in determining the methodology. At the time of the research the principle author conducted the qualitative interviews on their own. OBB, AW and DS aided in reviewing the results of the research and in writing up the discussion. The principle author drafted the research article itself. OBB, AW and DS edited and helped in writing the final research paper and in conducting edits on the research paper.

Data sharing statement

Data is available on reasonable request. Data from the semi-structured interviews has been pseudonymised i.e individual responses were assigned a code in lieu of participant identifiable data (name/address/date of birth). Data includes the audio recordings of the semi-structured and transcripts of these interviews.

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This data is available from the principle author (ORCID ID: [0000-0001-5412-877X](https://orcid.org/0000-0001-5412-877X)).

Funding statement

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Ethics Approval

Ethical approval for this project was granted by the Royal College of Surgeons in Ireland (RCSI) Research and Ethics Committee (REC) (Reference number: **201910013**).

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Competing interest statement

All authors have completed the Unified Competing Interest form (available on request from the corresponding author) and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years, no other relationships or activities that could appear to have influenced the submitted work

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Standards for Reporting Qualitative Research (SRQR)*

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Page/line no(s).

Title and abstract

Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	1
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	3

Introduction

Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	4
Purpose or research question - Purpose of the study and specific objectives or questions	4

Methods

Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	5
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	5
Context - Setting/site and salient contextual factors; rationale**	5
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	5/6
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	6
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	5/6

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	5/6
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	5/6/7
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	6
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	6
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	5

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	7
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	11/12

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	11/12
Limitations - Trustworthiness and limitations of findings	12

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	2
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	N/A

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

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